Agilent GC, MS, and ALS

Site Preparation Checklist

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This checklist outlines the space and resource requirements for a GC, 5975 MSD or 7000 Triple Quad GC/MS (referred to as MS in this document), and automatic liquid sampler (ALS) installation. For a successful and timely installation of the instrument, the site must meet these requirements before beginning installation. Necessary supplies (gases, tubing, operating supplies, consumables, and other usage-dependent items such as columns, vials, syringes, and solvents) must also be available. Note that performance verification requires the use of helium carrier gas and, for models using chemical ionization, methane reagent gas. Refer to the Agilent Web site at www.agilent.com/chem for the most up-to-date listing of GC, MS, and ALS supplies and consumables.

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Dimensions and Weight

Select the laboratory bench space before the system arrives. Pay special attention to the total height requirements. Avoid bench space with overhanging shelves. See Table 1.

Allow at least 20 cm clearance between back of GC and wall to dissipate air.

Table 1 Required height, width, depth, and weight

Product	Height	Width	Depth	Weight
7890A Series GCs	50 cm (19 in)	59 cm (23 in)	54 cm (21 in)	50 kg (112 lb)
With third detector	50 cm (19 in)	68 cm (27 in)	54 cm (21 in)	57 kg (125.4 lb)
7820A GC	49 cm (19.5 in)	56 cm (22 in)	51 cm (20.5 in)	50 kg (110 lb)
6890 Series GCs	54 cm (22 in)	55 cm (22 in)	54 cm (21 in)	50 kg (112 lb)
6850 Series GCs	51 cm (20 in)	29 cm (12 in) 34 cm (14 in) CO_2 37 cm (15 in) 6850 ALS	57 cm (23 in)	< 23 kg (51 lb)
7000 Triple Quad MS				
• Performance turbo pump	47 cm (18.5 in)	35 cm (14 in)	86 cm (34 in)	59 kg (130 lb)
• Performance CI/EI turbo pump4	47 cm (18.5 in)	35 cm (14 in)	86 cm (34 in)	63.5 kg (140 lb)
Foreline pump				
Standard	21 cm (8 in)	13 cm (5 in)	31 cm (12 in)	11 kg (23.1 lb)
Oil-free	19 cm (7.5 in)	32 cm (13 in)	28 cm (11 in)	16 kg (35.2 lb)
5975 Series MS				
• Diffusion pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	39 kg (85 lb)
• Standard turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	39 kg (85 lb)
• Performance turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	41 kg (90 lb)
• Performance CI/EI turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	46 kg (100 lb)

Table 1 Required height, width, depth, and weight (continued)

Product	Height	Width	Depth	Weight
Foreline pump				
Standard	21 cm (8 in)	13 cm (5 in)	31 cm (12 in)	11 kg (23.1 lb)
Oil-free	19 cm (7.5 in)	32 cm (13 in)	28 cm (11 in)	16 kg (35.2 lb)
G1888 Headspace sampler	56 cm (22 in)	46 cm (18.1 in)	64 cm (25 in)	46.3 kg (102 lb)
Additional space requirements				
• MS operational and maintenance access		Requires 30 cm (1 ft) to its left		
• Typical laser printer		Requires 41 cm (16 in)		
• GC operational oven access		Requires ≥ 30 cm (12 in) open space above GC		
• GC with 7693A ALS injector		Requires 50 cm (19.5 in) above the GC		
• GC with 7693A ALS tray		Requires 45 cm (17.5 in) left of the GC Requires 2 cm (1 in) in front of GC		
• GC with 7683B ALS injector		Requires 42 cm (16.5 in) above the GC		3.1 kg (7 lb) each
• GC with 7683B ALS tray		Requires 30 cm (12 in) left of the GC		3.0 kg (7 lb)
• GC with CTC PAL Autosampler		Requires 66 cm (26 in) above the GC and 4 to 20 cm (1.5 to 8 in) to the left or right, depending on configuration		

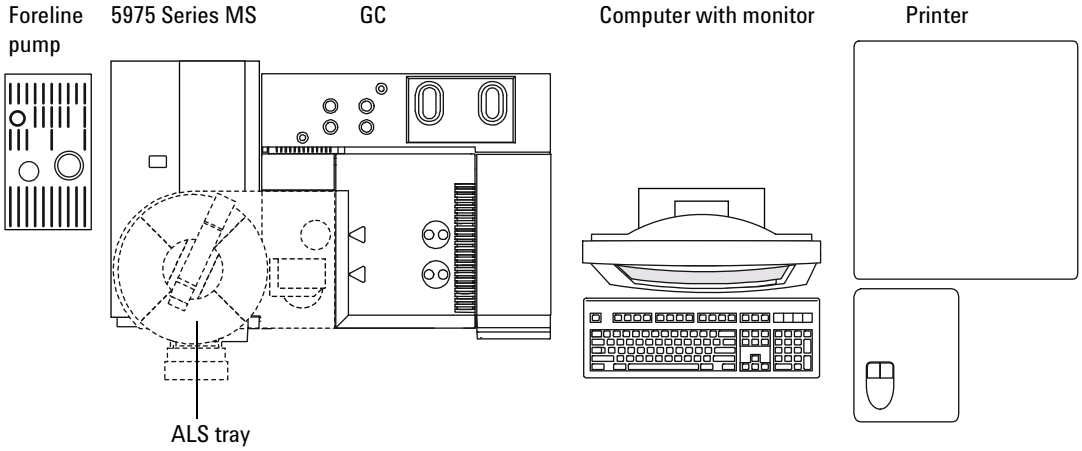

Figure 1 Top view of typical installation (GC/MS system with ALS)

A simple system that includes a GC, an ALS, and a computer would require about 153 cm (5 ft) of bench space. Allowing for operational access and a printer, a total of 244 cm (8 ft) of bench space should be available for a full GC/MS system. Some repairs to the MS or to the GC will also require access to the back of the instrument(s).

Note that the length of the vacuum hose is 130 cm (4 ft 3 in) from the high vacuum pump to the foreline pump, and the length of the foreline pump power cord is 2 m (6 ft 6 in).

Power Consumption

Table 2 lists site power requirements.

- The number and type of electrical outlets depend on the size and complexity of the system.
- Power consumption and requirements depend on the country the unit ships to.
- The electrical outlet for the unit should have a dedicated ground.

Table 2 Power requirements

Product		Line voltage (VAC)	Frequency (Hz)	Current rating (amps)	Maximum continuous power consumption (VA)	Outlets required
7890A	Standard oven	Americas: 120* single phase (–10% / +10%)	48–63	18.8	2250	1
		220/230/240 single/split phase (–10% / +10%)	48–63	10.2/9.8/9.4	2250	1
	Fast oven	Japan: 200 split phase (–10% / +10%)	48–63	14.8	2950	1
		220/230/240 † ‡ single/split phase (–10% / +10%)	48–63	13.4 / 12.8 / 12.3	2950	1
7820A	Standard oven	100 single phase (–10% / +10%)	48–63	12.5	1500	1
		120/200/220/230/240 single phase (–10% / +10%)	48–63	15.9 / 9.6/ 9.3 / 9.3 / 9.2	2250	1
6890	Standard oven	Americas: 120** single phase (–10% / +5%)	48–66	18.8	2250	1

Table 2 Power requirements (continued)

Product		Line voltage (VAC)	Frequency (Hz)	Current rating (amps)	Maximum continuous power consumption (VA)	Outlets required
6890 (cont.)		220/230/240 single/split phase (–10% / +5%)	48–66	10.2/9.8/9.4	2250	1
	Fast oven	Japan: 200 split phase (–10% / +5%)	48–66	14.8	2950	1
		220/230/240 †† ‡‡ single/split phase (–10% / +5%)	48–66	13.4 / 12.8 / 12.3	2950	1
6850	Standard oven	Japan: 100 single phase (–10% / +10%) ***	48–63	15	1440	1
		Americas: 120 single phase (–10% / +10%) ***	48–63	12	1440	1
		230 single/split phase (–10% / +10%) ***	48–63	9	2000	1
	Fast oven	120 single phase (–10% / +10%) ***	48–63	20	2400	1
		220/230/240 single/split phase (–10% / +10%) ***	48–63	11	2400	1
		200/208 single/split phase (–10% / +10%) ***	48–63	12	2400	1

Table 2 Power requirements (continued)

Product	Line voltage (VAC)	Frequency (Hz)	Current rating (amps)	Maximum continuous power consumption (VA)	Outlets required
7000 Triple Quad MS	120 (–10% / +5%)	50/60 ± 5%	8	1100 (400 for foreline pump only)	1
	220–240 (–10% / +5%)	50/60 ± 5%	8	1100 (400 for foreline pump only)	1
	200 (–10% / +5%)	50/60 ± 5%	8	1100 (400 for foreline pump only)	1
5975 Series MS	120 (–10% / +5%)	50/60 ± 5%	8	1100 (400 for foreline pump only)	1
	220–240 (–10% / +5%)	50/60 ± 5%	8	1100 (400 for foreline pump only)	1
	200 (–10% / +5%)	50/60 ± 5%	8	1100 (400 for foreline pump only)	1
Data system PC system (monitor, CPU, printer)	100 (–10% / +5%)	50/60 ± 5%	15	1000	3–5
	120 (–10% / +5%)	50/60 ± 5%	15	1000	3–5
	200–240 (–10% / +5%)	50/60 ± 5%	15	1000	3–5

*\Americas 120 VAC requires 20 amp dedicated line. Americas 240 VAC requires 15 amp dedicated line.

†\Option 003, 208 VAC fast oven, uses a 220 VAC unit with operating range of 198 to 242 VAC. Most labs have 4-wire service resulting in 208 VAC at the wall receptacle. It is important to measure the line voltage at the receptacle for the GC.

‡\Power line conditioners should not be used with the GC.

**\Americas 120 VAC requires 20 amp dedicated line. Americas 240 VAC requires 15 amp dedicated line.

††\Option 003, 208 VAC fast oven, uses a 220 VAC unit with operating range of 198 to 242 VAC. Most labs have 4-wire service resulting in 208 VAC at the wall receptacle. It is important to measure the line voltage at the receptacle for the GC.

‡‡\Power line conditioners should not be used with 6890 or 7890A GCs.

***\Requires an isolated ground and dedicated outlet.

Heat Dissipation

Use Table 3 to estimate the additional BTUs of heat dissipated from this equipment. Maximums represent the heat given off when heated zones are set for maximum temperatures.

Table 3 Heat dissipation

	Oven type	
	Standard oven ramp	**Fast oven ramp (option 002 or 003)**
7890A GC	7681 BTU/hour maximum	10,071 BTU/hour maximum
7820A GC	7681 BTU/hour maximum 5120 BTU/hour maximum (100 V power option)	—
6890 Series GC	7681 BTU/hour maximum	10,071 BTU/hour maximum
6850 Series GC	< 4800 BTU/hour maximum	< 4800 BTU/hour maximum
5975 Series MS	3000 BTU/hour including GC/MS interface	
7000 Triple Quad MS	3000 BTU/hour including GC/MS interface	

1 BTU = 1055.05585262 J

Environmental Conditions

Operating the GC/MSD within the recommended ranges optimizes instrument performance and lifetime. The instrument needs space for proper convection of heat and ventilation. Performance can be affected by sources of heat and cold from heating, air conditioning systems, or drafts. See Table 4.

Table 4 Environmental conditions for operation and storage

Product	Conditions	Operating temp range	Operating humidity range	Maximum altitude
7890A Series GC	Standard oven ramp	0 to 55 °C	5 to 95%	4,615 m
	Fast oven ramp (options 002 and 003)	0 to 55 °C	5 to 95%	4,615 m
	Storage	-20 to 70 °C	5 to 95%	
7820A GC	Standard oven ramp	5 to 45 °C	5 to 90%	3,100 m
	Storage	–20 to 65 °C	0 to 90%	
6890 Series GC	Standard oven ramp	20 to 27 °C	50 to 60%	4,615 m
	Fast oven ramp (options 002 and 003)	20 to 27 °C	50 to 60%	4,615 m
	Storage	5 to 40 °C	5 to 95%	
6850 Series GC	Standard oven ramp	15 to 35 °C	5 to 95%	4,615 m
	Fast oven ramp (options 002 and 003)	15 to 35 °C	5 to 95%	4,615 m
	Storage	-5 to 40 °C	5 to 95%	
7000 Triple Quad MS	Operation	15 to 35 °C* (59 to 95 °F)	40 to 80%	4,615 m†
	Storage	–20 to 70 °C (–4 to 158 °F)	0 to 95%	

Table 4 Environmental conditions for operation and storage (continued)

Product	Conditions	Operating temp range	Operating humidity range	Maximum altitude
5975 Series MS	Operation	15 to 35 °C* (59 to 95 °F)	40 to 80%	4,615 m†
	Storage	–20 to 70 °C (–4 to 158 °F)	0 to 95%	

*\Operation requires constant temperature (variations < 2 °C/hour)

†\5975B VL MS: 2,300 m

Gas Selection

Table 5 lists gases usable with Agilent GCs and capillary columns.

Table 5 Gases usable with Agilent GCs

Detector type	Carrier	Preferred makeup	Alternate choice	Detector, anode purge, or reference
Electron capture (ECD)	Hydrogen Helium Nitrogen* Argon/Methane*	Argon/Methane Argon/Methane Nitrogen Argon/Methane	Nitrogen Nitrogen Argon/Methane Nitrogen	Anode purge must be same as makeup
Flame ionization (FID)	Hydrogen Helium Nitrogen*	Nitrogen Nitrogen Nitrogen	Helium Helium Helium	Hydrogen and air for detector
Flame photometric (FPD)	Hydrogen Helium Nitrogen* Argon*	Nitrogen Nitrogen Nitrogen Nitrogen		Hydrogen and air for detector
Nitrogen-Phosphorus (NPD)	Helium Nitrogen*	Nitrogen Nitrogen	Helium Helium	Hydrogen and air for detector
Thermal conductivity (TCD)	Hydrogen Helium Nitrogen*	Must be same as carrier and reference	Must be same as carrier and reference	Reference must be same as carrier and makeup

*\Not generally suitable for MS carrier gas.

Agilent recommends that carrier and detector gases be 99.9995% pure. See Table 6. Air needs to be zero grade or better. Agilent also recommends using high quality traps to remove hydrocarbons, water, and oxygen.

Table 6 Carrier and reagent gases purity

Carrier and reagent gas requirements	Purity	Notes
Helium (carrier)	99.9995%	Hydrocarbon free
Hydrogen (carrier)	99.9995%	SFC grade
Methane reagent gas*	99.999%	Research or SFC grade
Isobutane reagent gas†	99.99%	Instrument grade
Ammonia reagent gas†	99.9995%	Research or SFC grade
Carbon dioxide reagent gas†	99.995%	SFC grade

*\Required reagent gas for installation and performance verification, CI MS only.

†\Optional reagent gases, CI MSs only

Gas Supply

Supply instrument gases using tanks, an internal distribution system, or gas generators. If used, tanks require two-stage pressure regulators with packless, stainless steel diaphragms. The GC/MS requires 1/8-inch Swagelok connections to its gas supplies. Plumb the gas supply tubing/regulators so that one 1/8-inch Swagelok female connector is available for each gas needed.

Table 7 lists minimum and maximum delivery pressures for inlets and detectors, measured at the bulkhead fittings on the back of the instrument.

Table 7 Delivery pressures required at the GC/MS, in kPa (psig)

	Detector type					Inlet type				
	FID	**NPD**	**TCD**	**ECD**	**FPD**	**Split/Splitless 150 psi**	**Split/Splitless 100 psi**	**On-column**	**Purged packed**	**PTV**
Hydrogen	240–690 (35–100)	240–690 (35–100)			310–690 (45–100)					
Air	380–690 (55–100)	380–690 (55–100)			690–827 (100–120)					
Makeup	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)					
Reference			380–690 (55–100)							
Carrier (max)						1,172 (170)*	827 (120)	827 (120)	827 (120)	827 (120)
Carrier (min)						(20 psi) above pressure used in method				

*Japan only 1013(147)

Conversions: 1 psi = 6.8947 kPa = 0.068947 Bar = 0.068 ATM

Notes:

- If you have not requested option 305, you must supply pre-cleaned, 1/8-inch copper tubing and a variety of 1/8-inch Swagelok fittings to connect the GC to inlet and detector gas supplies.
- Cyrogenic cooling with Liquid N_2 requires 1/4-inch insulated copper tubing.

- Cyrogenic cooling with Liquid CO_2 requires 1/8-inch heavy-walled, stainless steel tubing.
- Valve actuation requires a separate pressurized, dry air supply at 380 kPa (55 psig).
- Never use liquid thread sealer to connect fittings. Never use chlorinated solvents to clean tubing or fittings.

Table 8 lists the limits on total gas flow into the 5975 Series MS.

Table 8 5975 Series total gas flow limitations

Feature	G3170A	G3171A	G3172A	G3174A
High vacuum pump	Diffusion	Standard turbo	Performance turbo	Performance turbo, EI/PCI/NCI
Optimal gas flow mL/min*	1.0	1.0	1.0 to 2.0	1.0 to 2.0
Maximum recommended gas flow, mL/min	1.5	2.0	4.0	4.0
Maximum gas flow, mL/min†	2.0	2.4	6.5	4.0
Max column id	0.25 mm (30 m)	0.32 mm (30 m)	0.53 mm (30 m)	0.53 mm (30 m)

*\Total gas flow into the MS: column flow plus reagent gas flow (if applicable).

†\Expect degradation of spectral performance and sensitivity.

Table 9 lists typical flows resulting from selected carrier and reagent gas source pressures.

Table 9 **Carrier and reagent gas requirements**

Carrier and reagent gas requirements	Typical pressure range	Typical flow (mL/min)
Helium (required) (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50
Hydrogen (optional)* (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50

Table 9 **Carrier and reagent gas requirements** (continued)

Carrier and reagent gas requirements	Typical pressure range	Typical flow (mL/min)
Methane reagent gas (required for CI operation)	103 to 172 kPa (15 to 25 psi)	1 to 2
Isobutane reagent gas (optional)	103 to 172 kPa (15 to 25 psi)	1 to 2
Ammonia reagent gas (optional)	34 to 55 kPa (5 to 8 psi)	1 to 2
Carbon dioxide reagent gas (optional)	103 to 138 kPa (15 to 20 psi)	1 to 2

*\Hydrogen gas can be used for the carrier gas but specifications are based on helium as the carrier gas. Please observe all hydrogen gas safety cautions.

Other Considerations

Exhaust venting requirements for the GC/MS

Vent the MS externally to the building via an ambient-pressure vent system, within 460 cm (15 ft) of both the GC split vent and MS foreline pump, or vent to a fume hood. Note that an exhaust vent system is not part of the building environmental control system, which recirculates air. Exhaust venting must comply with all local environmental and safety codes. Contact your Environmental Health & Safety (EHS) specialist.

For GCs with the exhaust deflector option installed, the exhaust is about 65 ft^3/min (1.840 m^3/min). Without the deflector, the exhaust rate is about 99 ft^3/min (2.8 m^3/min). The deflector outlet diameter is 10 cm (4 in).

Basic tools

The GC/MS comes with a few basic tools and consumables depending on the specific inlet and detector that you ordered. Below is a general list of what comes with the instrument.

Tool or consumable	Used for
T10 and T20 Torx wrenches	Removing tray. Removing covers to access gas control modules, traps, and pneumatic connections.
1/4-inch nut driver	FID jet replacement.
FID flow measuring insert	FID troubleshooting.
Column cutter, ceramic or diamond	Column installation.
1/8-inch Tee, Swagelok, brass	Connect gas supplies.
1/8-inch nuts & ferrules, Swagelok, brass	Connect gas supplies.
Inlet septa appropriate for type	Inlet seal.
Inlet insert or liner	Contains sample during vaporization in inlet.
1.5-mm and 2.0-mm hex driver	Source maintenance (disassembly).
Tool bag	Holding GC and MS tools.
Q-Tips	Cleaning source parts.
Cloths	Keeping surfaces and parts clean.
Gloves	Reducing contamination on GC and MSD parts.
Funnel	Changing oil.
Hex key, 5 mm	Removing oil plug and screws in safety shield handle.

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